

IN THE CLAIMS:

1. (Original) An encoding method, comprising the steps of:

receiving an input video signal;

selectively encoding at least a portion of said input video signal by intra-frame encoding or predictive encoding to generate first encoded data, said predictive encoding including forward predictive encoding and backward predictive encoding;

transform encoding said first encoded data to generate first coefficient data;

quantizing said first coefficient data by a fixed step size;

variable length encoding said first quantized data to generate a first bit stream;

determining an encoding rate of said first bit stream every GOP as a function of a data quantity of intra-frame and forward-predictive encoded pictures only in the GOP;

selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;

transform encoding said second encoded data to generate second coefficient data;

setting a variable step size according to the encoding rate determined every GOP;

quantizing said second coefficient data by said variable step size;

variable length encoding said second quantized data to generate a second bit stream; and

outputting said second bit stream.

2. (Original) An encoding apparatus, comprising:

means for receiving an input video signal;

means for selectively encoding at least a portion of said input video signal by intra-frame encoding or predictive encoding to generate first encoded data, said predictive encoding including forward predictive encoding and backward predictive encoding;

means for transform encoding said first encoded data to generate first coefficient data;

means for quantizing said first coefficient data by a fixed step size;

means for variable length encoding said first quantized data to generate a first bit stream;

means for determining an encoding rate of said first bit stream every GOP as a function of a data quantity of intra-frame and forward-predictive encoded pictures only in the GOP;

means for selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;

means for transform encoding said second encoded data to generate second coefficient data;

means for setting a variable step size according to the encoding rate determined every GOP;

means for quantizing said second coefficient data by said variable step size;

means for variable length encoding said second quantized data to generate a second bit stream; and

means for outputting said second bit stream.

3. (Original) A recording medium on which there is recorded a second bit stream obtained by:

- receiving an input video signal;
- selectively encoding at least a portion of said input video signal by intra-frame encoding or predictive encoding to generate first encoded data, said predictive encoding including forward predictive encoding and backward predictive encoding;
- transform encoding said first encoded data to generate first coefficient data;
- quantizing said first coefficient data by a fixed step size;
- variable length encoding said first quantized data to generate a first bit stream;
- determining an encoding rate of said first bit stream every GOP as a function of a data quantity of intra-frame and forward-predictive encoded pictures only in the GOP;
- selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;
- transform encoding said second encoded data to generate second coefficient data;
- setting a variable step size according to the encoded data rate determined every GOP;
- quantizing said second coefficient data by said variable step size;
- variable length encoding said second quantized data to generate a second bit stream; and
- recording said second bit stream on said recording medium.

4. (Original) An encoding method, comprising the steps of:

- receiving an input video signal;

selectively encoding at least a portion of said input video signal by inter-frame encoding or predictive encoding to generate first encoded data, said predictive encoding including forward predictive encoding and backward predictive encoding;

transform encoding said first encoded data to generate first coefficient data;

quantizing said first coefficient data by a fixed step size;

variable length encoding said first quantized data to generate a first bit stream;

determining a difficulty of encoding said first bit stream every GOP based on inter-frame and forward-predictive encoded pictures only in the GOP;

calculating an encoding rate from said difficulty of encoding determined every GOP;

Q' selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;

transform encoding said second encoded data to generate second coefficient data;

quantizing the second coefficient data by a step size set according to said calculated encoding rate;

variable length encoding said second quantized data to generate a second bit stream; and

outputting said second bit stream.

5. (Original) An encoding apparatus, comprising:

means for receiving an input video signal;

means for selectively encoding at least a portion of said input video signal by intra-frame encoding or predictive encoding to generate first encoded data, said predictive

encoding including forward predictive encoding and backward predictive encoding;

means for transform encoding said first encoded data to generate first coefficient data;

means for quantizing said first coefficient data by a fixed step size;

means for variable length encoding said first quantized data to generate a first bit stream;

means for determining a difficulty of encoding said first bit stream every GOP based on intra-frame and forward-predictive encoded pictures only in the GOP;

means for calculating an encoding rate from said difficulty of encoding determined every GOP;

means for selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;

means for transform encoding said second encoded data to generate second coefficient data;

means for quantizing the second coefficient data by a step size set according to said calculated encoding rate;

means for variable length encoding said second quantized data to generate a second bit stream; and

means for outputting said second bit stream.

6. (Original) A recording medium on which there is recorded a second bit stream obtained by:

receiving an input video signal;

selectively encoding at least a portion of said input video signal by intra-frame encoding or predictive encoding to generate first encoded data, said predictive encoding including forward predictive encoding and backward predictive encoding;

transform encoding said first encoded data to generate first coefficient data;

quantizing said first coefficient data by a fixed step size;

variable length encoding said first quantized data to generate a first bit stream;

determining a difficulty of encoding said first bit stream every GOP based on intra-frame and forward-predictive encoded pictures only in the GOP;

calculating an encoding rate from said difficulty of encoding determined every GOP;

selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;

transform encoding said second encoded data to generate second coefficient data;

quantizing the second coefficient data by a step size set according to said calculated encoding rate;

variable length encoding said second quantized data to generate a second bit stream; and

recording said second bit stream on said recording medium.

7. (Original) An encoding method, comprising the steps of:

receiving an input video signal;

selectively encoding at least a portion of said input video signal by intra-frame or predictive encoding to generate first encoded data representing intra-frame or predictive encoded

pictures, respectively;

transform encoding said first encoded data to generate first coefficient data;

quantizing said first coefficient data by a fixed step size;

variable length encoding said first quantized data to generate a first bit stream;

counting a data quantity of said first bit stream every predetermined time to

indicate a difficulty of encoding;

determining said difficulty of encoding said first bit stream based on intra-frame

and forward-predictive encoded pictures only;

calculating an allocated code quantity for each unit of predetermined time as a

function of said difficulty of encoding so that said allocated code quantity is set to be larger for

complex pictures and smaller for simple pictures;

selectively encoding said input video signal by intra-frame or predictive encoding

to generate second encoded data;

transform encoding said second encoded data to generate second coefficient data;

quantizing said second coefficient data at a step size set in response to said

allocated code quantity;

variable length encoding said second quantized data to generate a second bit

stream; and

outputting said second bit stream.

8. (Original) A method according to claim 7, wherein the fixed quantization step size equals one.

9. (Original) A method according to claim 7, further comprising the step of storing said second bit stream in a buffer before it is output, wherein said quantization step size is further based on a quantity of said second bit stream stored in said buffer.

10. (Original) A method according to claim 7, wherein said predetermined time is a frame.

11. (Original) An encoding apparatus, comprising:

means for receiving an input video signal;

means for selectively encoding at least a portion of said input video signal by intra-frame or predictive encoding to generate first encoded data representing intra-frame or predictive encoded pictures, respectively;

means for transform encoding said first encoded data to generate first coefficient data;

means for quantizing said first coefficient data by a fixed step size;

means for variable length encoding said first quantized data to generate a first bit stream;

means for counting a data quantity of said first bit stream every predetermined time to indicate a difficulty of encoding;

means for determining said difficulty of encoding said first bit stream based on intra-frame and forward-predictive encoded pictures only;

means for calculating an allocated code quantity for each unit of predetermined time as a function of said difficulty of encoding so that said allocated code quantity is set to be

larger for complicated pictures and smaller for simple pictures;

means for selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;

means for transform encoding said second encoded data to generate second coefficient data;

means for quantizing said second coefficient data at a step size set in response to said allocated code quantity;

means for variable length encoding said second quantized data to generate a second bit stream; and

means for outputting said second bit stream.

12. (Original) An apparatus according to claim 11, wherein the fixed quantization step size equals one.

13. (original) An apparatus according to claim 11, further comprising a buffer for storing said second bit stream before it is output, wherein said quantization step size is further based on a quantity of said second bit stream stored in said buffer.

14. (Original) An apparatus according to claim 11, wherein said predetermined time is a frame.

15. (Original) A recording medium on which there is recorded a second bit

stream obtained by:

receiving an input video signal;

selectively encoding at least a portion of said input video signal by intra-frame or predictive encoding to generate first encoded data representing intra-frame or predictive encoded pictures, respectively;

transform encoding said first encoded data to generate first coefficient data;

quantizing said first coefficient data by a fixed step size;

variable length encoding said first quantized data to generate a first bit stream;

counting a data quantity of said first bit stream every predetermined time to

indicate a difficulty of encoding;

determining said difficulty of encoding said first bit stream based on intra-frame

and forward-predictive encoded pictures only;

calculating an allocated code quantity for each unit of predetermined time as a

function of said difficulty of encoding so that said allocated code quantity is set to be larger for complicated pictures and smaller for simple pictures;

selectively encoding said input video signal by intra-frame or predictive encoding to generate second encoded data;

transform encoding said second encoded data to generate second coefficient data;

quantizing said second coefficient data at a step size set in response to said allocated code quantity;

variable length encoding said second quantized data to generate a second bit stream; and

recording said second bit stream on said recording medium.

16. (Currently Amended) An encoding method for encoding source video data, the method comprises the steps of:

encoding said source video data with a predetermined quantization step size to generate first encoded data;

detecting a difficulty of the encoding process of source video data based on bit amount of said first encoded data;

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deciding an optimum quantization step size, said optimum quantization step size being which is varied depending on said difficulty so that said optimum quantization step size becomes smaller when said source video data is more complex complexity and said optimum quantization step size becomes larger when source video data to be encoded is more simple; and

encoding said source video data by using said optimum quantization step on encoding unit basis,

wherein the predetermined quantization step size has a fixed value and the optimum quantization step size has a non-fixed value.

17. (Currently Amended) An encoding method for encoding source video data, the method comprises the steps of:

calculating a difficulty of said source video data, wherein said difficulty indicates a complexity of a picture within said source video data;

deciding an optimum quantization step size which is varied depending on said difficulty so that said quantization step size becomes smaller when said source video data is more complex ~~complexity~~ and said quantization step size becomes larger when source video data to be encoded is more simple; and

encoding said source video data by using said optimum quantization step,

wherein the optimum quantization step size has a non-fixed value.

18. (Currently Amended) An encoding method for encoding source video data, the method comprises the steps of:

encoding said source video data to generate first encoded data;

detecting a difficulty of the encoding process of source video data based on amount of said first encoded data;

calculating an allocated code quantity which is varied depending on said difficulty so that said allocated code quantity is more increased when said source video data is more complex ~~complexity~~ and said allocated code quantity is more decreased when source video data is more simple; and

encoding said source video data by an optimum quantization step size based on said allocated code quantity,

wherein the optimum quantization step size has a non-fixed value.

19. (Currently Amended) An encoding method for encoding source video data, the method comprises the steps of:

calculating a difficulty of said source video data, wherein said difficulty indicates a complexity of a picture within said source video data;

calculating an allocated code quantity which is varied depending on said difficulty so that said allocated code quantity is more increased when said source video data is more ~~complex~~ complexity and said allocated code quantity is more decreased when source video data is more simple; and

Q! encoding said source video data by an optimum quantization step size based on said allocated code quantity,

wherein the optimum quantization step size has a non-fixed value.

20. (Currently Amended) An encoding method for encoding source video data, the method comprises the steps of:

detecting motion vector of a macro block of said source video data;

encoding said macro block of said source video data by using a predetermined quantization step size and said detected motion vector to generate first encoded data;

detecting a difficulty of the encoding process of source video data based on amount of said first encoded data;

deciding an optimum quantization step size, said optimum quantization step size being ~~which~~ is varied depending on said difficulty so that said optimum quantization step size

becomes smaller when said source video data is more ~~complex~~ ~~complexity~~ and said optimum quantization step size becomes larger when source video data to be encoded is more simple; and

encoding said macro block of said source video data by using said optimum quantization step and said detected motion vector,

wherein the predetermined quantization step size has a fixed value and the optimum quantization step size has a non-fixed value.

21. (Currently Amended) An encoding method for encoding source video data, the method comprises the steps of:

selecting a predictive mode of a macro block of said source video data;

encoding said macro block of said source video data by using a predetermined quantization step size and said selected predictive mode to generate first encoded data;

detecting a difficulty of the encoding process of source video data based on amount of said first encoded data;

deciding an optimum quantization step size, said optimum quantization step size being which is varied depending on said difficulty so that said optimum quantization step size becomes smaller when said source video data is more ~~complex~~ ~~complexity~~ and said optimum quantization step size becomes larger when source video data to be encoded is more simple; and

encoding said macro block of said source video data by using said optimum quantization step and said selected predictive mode,

wherein the predetermined quantization step size has a fixed value and the optimum quantization step size has a non-fixed value.

22. (Currently Amended) An encoding apparatus for encoding source video data, the apparatus comprising:

means for detecting motion vector of a macro block of said source video data;

first encoding means for encoding said macro block of said source video data by using a predetermined quantization step size and said detected motion vector to generate first encoded data;

means for detecting a difficulty of the encoding process of source video data based on amount of said first encoded data;

means for deciding an optimum quantization step size, said optimum quantization step size being which is varied depending on said difficulty so that said optimum quantization step size becomes smaller when said source video data is more complex complexity and said optimum quantization step size becomes larger when source video data to be encoded is more simple; and

second encoding means for encoding said macro block of said source video data by using said optimum quantization step and said detected motion vector,

wherein the predetermined quantization step size has a fixed value and the optimum quantization step size has a non-fixed value.

23. (Currently Amended) An encoding apparatus for encoding source video data, the apparatus comprising:

means for selecting a predictive mode of a macro block of said source video data;

first encoding means for encoding said macro block of said source video data by using a predetermined quantization step size and said selected predictive mode to generate first encoded data;

means for detecting a difficulty of the encoding process of source video data based on amount of said first encoded data;

a' means for deciding an optimum quantization step size, said optimum quantization step size being which is varied depending on said difficulty so that said optimum quantization step size becomes smaller when said source video data is more complex complexity and said optimum quantization step size becomes larger when source video data to be encoded is more simple; and

second encoding means for encoding said macro block of said source video data by using said optimum quantization step and said selected predictive mode,

wherein the predetermined quantization step size has a fixed value and the optimum quantization step size has a non-fixed value.

24. (Currently Amended) An encoding apparatus for encoding source video data, the apparatus comprising:

first encoding means for encoding said source video data with a predetermined quantization step size to generate first encoded data;

second encoding means for encoding said source video data based on supplied quantization step size to generate second encoded data;

transmitting buffer for buffering said second encoded data; and

control means for detecting a difficulty of the encoding process in said first encoding means, and for deciding said quantization step size, said optimum quantization step size being which is varied depending on said difficulty so that said quantization step size becomes smaller when said source video data is more complex ~~complexity~~ and said quantization step size becomes larger when source video data to be encoded is more simple, and said quantization step size ~~which is varied depending~~ being dependent on a remaining capacity of said transmitting buffer so as to suppress overflow and underflow in said transmitting buffer,

wherein the predetermined quantization step size has a fixed value and the optimum quantization step size has a non-fixed value.

25. (Currently Amended) An encoding apparatus for encoding source video data, the apparatus comprising:

encoding means for encoding said source video data based on a quantization step size to generate encoded stream;

transmitting buffer for buffering said encoded stream; and

control means for calculating a difficulty of said source video data, wherein said difficulty indicates a complexity of a picture within said source video data, and for deciding said quantization step size which is varied depending on said difficulty so that said quantization step size becomes smaller when said source video data is more complex ~~complexity~~ and said

quantization step size becomes larger when source video data to be encoded is more simple,
wherein said quantization step size which is varied depending on a remaining capacity of said
transmitting buffer so as to suppress overflow and underflow in said transmitting buffer,

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wherein said optimum quantization step size has a non-fixed value.
